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Public Opinion on Freshwater Issues and Management in Canterbury

Andrew Cook

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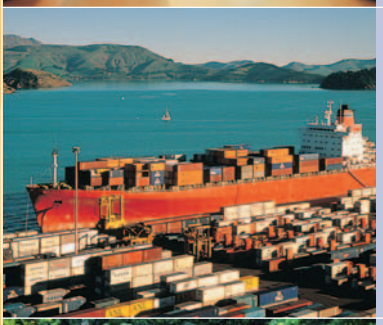

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Preface

The AERU frequently provides research results useful for public debate about topical issues. While these reports are authored by in-house researchers, at times we also publish research by other people with whom we have ongoing working relationships. In keeping with this tradition, this report presents public opinion about the contemporary issues of freshwater management in Canterbury. This report will be of interest to all people involved in the management of freshwater.

Professor Caroline Saunders
Director
AERU

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Summary

Research aim

- The aim of the research was to measure Canterbury public opinion on freshwater issues and management.

Method

- A telephone survey questionnaire was designed containing 13 measures of opinion and measures of age, income and gender. In addition, data regarding opinion of water issues and management was used from Canterbury respondents to the 2004 and 2008 Lincoln University surveys of environmental perceptions.
- There were 500 respondents to the telephone survey, which had a response rate of 46.6 per cent. There were 121 Canterbury respondents to the 2004 Lincoln survey which had a national response rate of 43 per cent and 115 respondents in 2008, which had a national response rate of 40 per cent.

Representativeness

- As is not uncommon, compared to census results there was imperfect representation of gender, age and income groups in all the surveys. In addition, there was evidence of minor bias in terms demographic results for some opinion measures for the telephone survey only. These analyses plainly showed the representativeness of the surveys and enabled a more accurate estimation of Canterbury public opinion.

Results from the telephone survey

- Almost all (96.2 per cent) indicated agreement that water in Canterbury rivers should be suitable for swimming, fishing and other recreational activities.
- Almost all (99 per cent) agreed the priority for water management should be to ensure each home has a ‘good supply of clean, safe and inexpensive water’.
- Almost all (98.2 per cent) agreed that the quality and quantity of water in rivers, lakes, streams and aquifers should be protected for the benefit of future generations.
- A large proportion agreed (91.5 per cent) that chlorinating household drinking water should be avoided.
- More disagreed (39.1 per cent) than agreed (36.2 per cent) with charging for water above a basic allocation but together with those who neither agreed nor disagreed (24.7 per cent), most respondents (60.9 per cent) did not oppose having to pay.
- The majority agreed (59.2 per cent) that farmers and commercial users should have to pay for each litre of water used. Just over 18 per cent (18.1 per cent) disagreed.
- The majority agreed (69.8 per cent) and 11.5 per cent disagreed that irrigation for intensive livestock farming would lead to contamination of drinking water supplies and poorer water quality in rivers, streams or lakes.
- A large majority agreed (83.5 per cent) that the community should not have to pay for the clean up of environmental damage resulting from farming.
- A large majority agreed (81.1 per cent) to a hold on allocation of water for irrigation until research had been done so as to ensure that the quality and quantity of water would not fall below acceptable standards. Just over seven percent (7.1 per cent) disagreed.

- While the community may benefit from the use of irrigation water for farming, most (56.7 per cent) were unwilling to accept effects on drinking water supplies, rivers, streams and lakes. Nevertheless, 26.4 per cent agreed the effects would be acceptable.
- Many (33.8 per cent) indicated they 'don't know' whether current legislation protects drinking water supplies and rivers, streams and lakes from contamination. For those provided their opinion, just over half agreed (51 per cent) and 31.7 per cent disagreed.
- More agreed (41.5 per cent) than disagreed (30.1 per cent) that Environment Canterbury was judged to have 'done its job' of managing freshwater.
- Just under one third agreed (31.4 per cent) and just over one third disagreed (34.4 per cent) that local and regional councillors have adequately represented the views and interests of the community on water management. However, of the 500 respondents 20.8 per cent said they 'don't know'

Results from the Lincoln University surveys

- Most judged water quality to be good or extremely good in 2008 (51.4 per cent) and 36.7 per cent judged it good or extremely good in 2004.
- For those who gave provided an opinion, most judged the quality of water in Canterbury aquifers to be good or extremely good in both 2004 (63.3 per cent) and 2008 (66.3 per cent). Of note, Canterbury respondents judged the quality of water in their aquifers to be of better quality than had those from other regions.
- A large proportion judged quality of water in Canterbury lakes to be good or extremely good in 2004 (42.6 per cent) and 2008 (48.5 per cent). In addition, Canterbury respondents judged the quality of water in their lakes to be of better quality than had those from other regions.
- A larger proportion considered management of rivers and streams by Environment Canterbury was good (37.0 per cent) than considered it poor (22.0 per cent).
- A larger proportion considered management of aquifers by Environment Canterbury was good (37.0 per cent) than considered it poor (22.0 per cent).
- Most considered management of lakes by Environment Canterbury to be adequate (55.2 per cent). Nevertheless, more judged management of lakes to be good (33.3 per cent) than judged it to be poor (11.5 per cent).
- Most considered policy making by the MfE for rivers and streams to be adequate (51.2 per cent), while the proportion of those judging it to be good (28.0 per cent) exceeded those who judged it was poor (20.7 per cent).
- A larger proportion judged MfE policy making for lakes to be good (27.5 per cent) and 16.3 per cent judged it to be poor.
- The majority disagreed or strongly disagreed with the taking of water for irrigation in both 2004 (67.5 per cent) and 2008 (68.9 per cent).
- The majority disagreed or strongly disagreed that water in small lowland streams was of high quality in both 2004 (63.2 per cent) and 2008 (54.9 per cent). A smaller proportion agreed or strongly agreed in 2008 (20.5 per cent), compared to 2004 (24.1 per cent). For both years, there was a higher proportion of Canterbury respondents disagreeing that water in small lowland streams was of good quality.
- A large proportion disagreed or strongly disagreed that the streams were well managed in both 2004 (48.8 per cent) and 2008 (38.5 per cent).
- In both 2004 and 2008 a large proportion disagreed or strongly disagreed with the taking of water for irrigation from small lowland streams (respectively 86.4 and 73.7 per cent).
- A large proportion in both 2004 (55.1 per cent), and 2008 (42.5 per cent) disagreed or strongly disagreed that small lowland streams were in good condition.

- A large proportion disagreed or strongly disagreed that water quality in small lowland streams in Canterbury had not been damaged by dairy farming in both 2004 (55.1 per cent), and 2008 (42.5 per cent). There was a greater proportion of Canterbury respondents strongly disagreeing in 2004 (chi square, $p < 0.05$) and 2008 (chi square, $p < 0.06$) that no damage had been done in both years compared to respondents from other regions.
- A large proportion disagreed or strongly disagreed that more water should be taken from aquifers in Canterbury in both 2004 (56.7 per cent), and 2008 (58.7 per cent). There was a smaller proportion from Canterbury who either disagreed (36.1 per cent) or strongly disagreed (22.6 per cent) compared to other regions (respectively, 28.5 and 10.5 per cent; chi square, $p > 0.001$).

Implications and recommendations

- The research shows that the Canterbury public would be readily supportive of the objectives of (1) having water of suitable standard for contact and other forms of recreation, (2) having a good supply of clean, safe and inexpensive water, and (3) protecting the quality and quantity of freshwater for future generations.
- The maintenance of water sources that do not require treatment should be a priority given widely held strong objections to adding chlorine to drinking water.
- All else being equal, the taking of water for irrigation that facilitates more intensive agriculture and damage to clean water sources is not acceptable to the public. It is recommended that detailed consideration be given in policy and plans regarding irrigation and its effects, as well as detailed consideration of the effects of particular irrigation projects.
- The community is unwilling to bear the costs of environmental damage to freshwater from agriculture. Consideration needs to be given to addressing this seemingly intractable problem.
- The public would support a hold on the consideration of applications for the use of water until research has been done sufficient to guarantee an acceptable standard.
- As there is a good deal of concern about water issues and freshwater management, it is recommended that more attention be given to informing and involving the public.

Chapter 1
Introduction

1.1 Introduction

Water quality in some parts of New Zealand is degraded by agriculture. Streams, lakes and rivers are affected by an increase in nutrients and sediments that impact upon ecology, recreational users and raise concern over health issues. Further adverse affects are evident from the use of water for irrigation, the damming of rivers for hydroelectric power generation and industries that discharge into water. The impacts have been well documented in the Ministry for the Environment (MfE) State of New Zealand's Environment reports (MfE, 1997; 2007). Certain issues have also received particular attention, such as water quality in lakes and rivers (Hamill, 2006; Scarsbrook, 2006), increased nitrate levels in groundwater (Ford and Taylor, 2006) and recreation values (MfE, 2004). In addition, there have been strong arguments for the implementation of environmentally sustainable agriculture (Parliamentary Commissioner for the Environment, 2004). In tandem, while many consider the quality of New Zealand freshwaters is adequate or improving, an increasing proportion of New Zealanders are of the view that water quality in lakes, rivers, streams and aquifers is becoming worse (Hughey, Kerr and Cullen, 2006; Hughey, Kerr and Cullen, 2008).

Alongside concern over freshwater resources has been dissatisfaction with management and legislative processes on which they are founded. The Resource Management Act (1991), the cornerstone of environmental management in New Zealand, was designed to enable development while managing adverse effects. Nevertheless, there have been increasing demands on freshwater, such as for irrigation, along with declining water quality in some areas. Consequently, there are increasing pressures on freshwater management, which is made more difficult by an incomplete understanding of the ecology and dynamics of water ecosystems (MfE, 2006a). In response, one government led initiative has been to consider regionally focused management of freshwater (MfE, 2006a and 2006b). This could lead to the MfE supporting the use of management tools best suited to the communities and issues of a region. Most recently these proposals have been incorporated in the Proposed National Policy Statement for Freshwater Management whereby regional development of freshwater management is proposed to have some precedent over national policy (MfE, 2008). However, while there is general approval of this integrated approach (e.g. New Zealand Business Council for Sustainable Development, 2008a), it is only in the development stage.

It is evident that while initiatives are being taken to better manage water, there is an immediate need for improvements in freshwater management. At present there are a number of major development proposals for irrigation in Canterbury and continued intensification of agriculture. The research presented in this report is intended to measure the degree of concern that the Canterbury public has regarding freshwater issues and management so as to inform the consideration of proposals for use of water and give impetus to improvements in water management. Prior research on public opinion has shown that farming has become the leading perceived cause of damage to freshwater. The public is also increasingly concerned about the condition of freshwater and the quality of its management (Hughey, Kerr and Cullen, 2008; New Zealand Business Council for Sustainable Development, 2008b).

The aim of the research presented in this report was to measure Canterbury public opinion on freshwater issues and management. To meet this aim public opinion was measured by

surveying a representative sample of the population of Canterbury by telephone and by using data from Canterbury respondents to surveys conducted by Lincoln University on environmental perceptions. These two methods were designed to comprehensively measure and represent public opinion.

To outline the remainder of this report, this introduction is followed by an explanation of methods. Results are then provided from both the telephone and Lincoln Survey with the final concluding chapter including consideration of implications and recommendations.

Chapter 2
Method

2.1 Introduction

This chapter provides details of the telephone survey method and method for the Lincoln University postal surveys used to measure environmental perceptions from which selected data of relevance to freshwater management was used to meet the aim of this research.

2.2 Statistical methods

In terms of statistical methods all measurements were treated as ordered categories and tests of differences were performed using chi-square. Tests for representativeness were performed using a chi-square test for representativeness.

2.3 The telephone survey

A questionnaire was designed to gather public opinion on freshwater issues and management for those living in Canterbury as defined by the boundaries of Environment Canterbury, which is the Canterbury Regional Council. The questionnaire had the constraint of taking no longer than fifteen minutes. It was judged that respondents might tire or be less tolerant of a longer list of questions. Initially it was planned to measure responses to 15 opinion questions but this was subsequently trimmed to 13. Measures of age and income were included and a record of gender was taken which was inferred by the interviewer during each survey.

Measurement of opinion was taken on a standard 5-point Likert scale ranging from ‘strongly agree’ to ‘strongly disagree’. The ‘questions’ were actually statements with respondents asked to indicate their level of agreement or disagreement or indicate a neutral response. Records of ‘don’t know’, ‘pass’ and ‘refuse to answer’ were also taken. It eventuated that no respondent refused to answer any of the opinion questions but, as shown in the results, one respondent refused to provide their age and some refused to provide their income.

2.3.1 The opinion questions

The questions were designed to measure a variety of freshwater issues and important aspects of management. The exact wording of each statement read to the respondents is shown with the descriptive results for each question in the results chapter. In addition, the questions and interview script is provided in the appendix to this report.

The questions were ordered so that the initial ones required less deliberation so as to ease respondents into the task of answering. First, measurement was taken regarding suitability for swimming, fishing and other forms of recreation. This was followed by a measure of whether a good clean water supply should be a priority for management. The third question covered the topic of sources of drinking water. The fourth was designed to measure opinion on the topic of chlorinating drinking water. This was followed by a measure of the willingness to pay for clean water. A further measure was of the opinion of whether farmers and commercial users should pay for water. Measurement was then taken of whether or not it was judged that an increase in irrigation for intensive livestock farming would result in the contamination of drinking water supplies and poorer water quality in rivers, streams or lakes.

The questionnaire continued with a measure of whether or not the community should have to pay for the clean up of environmental damage resulting from farming. This was worded 'should not have to pay' so as to balance the overall valence of the questions. The ninth question was somewhat longer than the others and consequently was introduced later when the respondents were presumably used to the style of the questions. It was designed to measure respondent opinion regarding water allocation with the condition that research had been done and a guarantee can be given that the quality and quantity of water will not fall below acceptable standards. The tenth question suggested benefits to the community from the use of irrigation water and was designed to measure willingness to accept effects on drinking water supplies lakes and rivers. In order to keep the statement brief it was not stated but was assumed that respondents would be thinking of negative effects. The next questions sought to measure opinion regarding whether current legislation protects water and drinking water supplies from contamination and whether the Environment Canterbury territorial authority had done its job in this area. The last question measured opinion regarding whether local and regional councillors adequately represented the views and interests of the Canterbury public on management of freshwater.

Measures of age and income were recording using categories so as to be less intrusive and to ensure ready comparison with census results.

2.3.2 Distribution, response rate and potential bias

The telephone surveying began on July 9th and was completed on July 23rd, 2008. The survey was administered using a randomly derived list of publicly listed telephone numbers for households in Canterbury, with responses taken from those 18 or more years of age.

The response rate for the survey is the number of respondents that participated over the number of households contacted. In total 1,071 telephone calls were made with an invitation to participate in the survey. The response rate was therefore 500/1072 or 46.6 per cent.

The issue of non-respondent bias is a concern for survey research. Non-respondent bias is a form of bias that occurs when the opinion of those who did not respond to the survey differs from those who responded and can affect the representation of the opinion of the wider population. Commonly, possible differences in opinion between those who answered a survey and those who did not are unknown to researchers who merely gather data from those who responded. Nevertheless, telephone surveys can readily record the reasons why people do not participate.

In gathering the data for the research reported in this report a record was taken of the reasons given by those who chose not to respond (Table 2.1). As shown, 'too busy' was the most common reason with the next most common being the somewhat non-specific 'not interested'. Of note, very few indicated they were not interested in the subject matter. This suggests that the survey was relatively unbiased in terms of differences in opinion because those interested in the subject matter, who presumably have stronger views, appear not to be over represented.

Table 2.1: Reasons for not participating

Reason	Frequency	%
Too busy	303	53.0
Not interested	160	27.0
Not interested in subject matter	15	2.6
Don't do surveys	10	1.7
Other (includes hearing disability, sickness, not a resident of Canterbury, disconnected, language difficulties and hung up on interviewer)	84	14.7
Total	572	100

Frequencies and percentages from the telephone survey for age, income and gender are shown in Table 2.2 with corresponding results from the 2006 census. In terms of age there was a smaller proportion of respondents to the survey in the younger age group of 18 to 29 years and a larger proportion of older respondents compared to census results. There were also smaller proportions of those in the lowest income groups and proportionately more females than males responded to the survey compared with census results. Chi-square tests for representativeness found significant differences between the survey sample and census results for age, income and gender. This is not uncommon in survey research.

Table 2.2: Survey demographic results and census results

	Frequency	%	Census %*
Age			
18-29	34	6.8	17.0
30-39	78	15.6	19.6
40-49	91	18.2	20.7
50-59	89	17.8	17.4
60-69	111	22.2	11.7
70 or more	96	19.2	13.7
Total	499	100	100
Income			
$20,000 or less	106	24.0	45.1
$20,001-$40,000	135	30.5	31.7
$40,001-$70,000	123	27.8	16.4
More than $70,000	78	17.6	6.8
Total	442	100	100
Gender			
Male	186	37.2	48.0
Female	314	62.8	52.0
Total	500	100	100

*Note: Gender and age from the census is shown for those over 20 years of age. Only one survey respondent was under 20 years of age.

2.4 The Lincoln survey

The Lincoln postal surveys of environmental perceptions have been conducted every two years since 2000. General perceptions of pressure on water resources, their condition and management of water have been have been reported for the previous surveys. In addition, of the five surveys, those conducted in 2004 and 2008 included sections on freshwater management. To meet the aim of this report data were analysed from the sections on water management from these two surveys for Canterbury respondents. Most of the questions used in 2004 were repeated in 2008. Both had the same measures of the quality and management

of rivers and streams, aquifers and lakes. The 2008 survey also had new measures of quality of aspects of management of freshwater resources by the local Regional Council and the policy making by the Ministry for the Environment. Measurements of the quality of freshwater resources and management were taken using a five-point Likert type scale anchored by 'extremely good' and 'extremely poor'. Measurement was also made in both surveys of agreement or disagreement with statements concerning water management and quality regarding large rivers, small lowland streams and aquifers as well as damage to small lowland streams by dairy farming. These measures were taken using a five-point Likert scale anchored by 'strongly agree' and 'strongly disagree'. In addition, each survey included measures of a broad range of demographic information of which measures of gender, age and income are shown in this report. In total thirteen measurements of opinion were used in the analysis presented in this report.

The 2004 survey response rate was 43 per cent (N = 820) and the 2008 survey response rate was 40 per cent (N = 752). For the 2008 survey, respondents indicated Canterbury as the region as part of the demographic information they were asked to provide. For the 2004 survey those from the Canterbury region were identified using postcodes for the area covered by Environment Canterbury. The number of respondents from Canterbury for the 2004 survey was 121 and the number for 2008 was 115. Of note, Hughey, Kerr and Cullen (2008) have provided results from the 2008 survey regarding national perceptions of water management. More detail of method and further results of relevance can be found in the currently pending 2008 Lincoln report.

Frequencies and percentages for Canterbury respondents to the Lincoln survey for age, income and gender are shown in Table 2.3 with corresponding results from the 2006 census. In a similar result to the telephone survey in terms of age there was a smaller proportion of respondents to the survey in the youngest age group (under 29). There were also smaller proportions of those in the lowest income group. Compared to census results, fewer males than females responded to the 2004 survey and proportionately more males responded in 2008. Chi-square tests for representativeness found significant differences between the survey sample and census results.

Table 2.3: Demographic measures and census results

	2004 frequency	2004 %	2008 frequency	2008 %	Census %
Age					
Under 29	7	6.1	3	2.8	24.5
30-39	21	18.3	14	13.0	17.8
40-49	29	25.2	19	17.6	18.7
50-59	32	27.8	29	26.9	15.9
60-69	14	12.2	20	18.5	10.7
70 or more	12	10.4	23	21.3	12.5
Total	115	100.0	108	100.0	100.0
Income					
$20,000 or less	43	41.7	28	29.8	45.1
$20,001-$40,000	31	30.1	33	35.1	31.7
$40,001-$70,000	26	25.2	27	28.7	16.4
More than $70,000	3	2.9	6	6.4	6.8
Total	103	100.0	94	100.0	100
Gender					
Male	54	44.6	65	56.5	48.3
Female	67	55.4	50	43.5	51.7
Total	121	100.0	115	100.0	100.0

*Note: Gender and age from the census is shown for those over 15 years of age.

Chapter 3
Results

3.1 Introduction

This chapter presents the results of the analysis of the survey data from the telephone survey and the Lincoln postal survey. In both cases the order of presentation follows the order in which survey respondents answered the questions. Of note, at the start of each table presenting results are the actual statements used in the surveys. Frequencies and percentages including 'don't know' responses are provided as well as a combined percentage to assist in interpretation. For the Lincoln results percentages for responses from regions other than Canterbury are also included. The results of chi square tests for differences between 2004 and 2008 and chi-square tests between Canterbury responses and those from the rest of New Zealand are shown for each of the Lincoln survey results. The results of chi-square tests for differences in opinion based on age, income and gender are shown at the end of each section. Interpretation of the results is provided, with further discussion in the concluding chapter.

3.2 Results from the telephone survey

3.2.1 Suitability for recreation

Table 3.1 shows the results for the responses to question 1. The statement and response scale measured the opinion of respondents regarding water quality for contact recreation as well as other forms of recreation. As shown, almost all respondents (96.2 per cent) indicated agreement that the water in Canterbury rivers should be suitable for swimming, fishing and other recreational activities. Of the 500 respondents only three (0.6 per cent) disagreed.

Table 3.1: Suitability for recreation

1. The water in Canterbury rivers, streams and lakes should be suitable for swimming, fishing and other recreational activities.				
	n	**% all**	**% 1 – 5 (N = 500)**	**% combined**
Strongly agree (1)	412	82.4	82.4	96.2
Agree (2)	69	13.8	13.8	
Neither agree nor disagree (3)	16	3.2	3.2	3.2
-Disagree (4)	3	0.6	0.6	0.6
Strongly disagree (5)	0	0.0	0.0	
Don't know	0	0.0	-	-
Pass	0	0.0	-	-
Total	500	100	100	100

3.2.2 Priority for water management

It was suggested to respondents that the priority for water management should be to ensure each home has a 'good supply of clean, safe and inexpensive water'. As shown in Table 3.2, almost all respondents (99 per cent) agreed and a sizable proportion strongly agreed (89.2 per cent).

Table 3.2: Priority for water management

2. The priority for water management in Canterbury should be to ensure that every home has a good supply of clean, safe and inexpensive water.				
	n	**% all**	**% 1 – 5 (N = 500)**	**% combined**
Strongly agree (1)	446	89.2	89.2	99.0
Agree (2)	49	9.8	9.8	
Neither agree nor disagree (3)	3	0.6	0.6	0.6
Disagree (4)	1	0.2	0.2	0.4
Strongly disagree (5)	1	0.2	0.2	
Don't know	0	0.0	-	-
Pass	0	0.0	-	-
Total	500	100	100	100

3.2.3 Protection of water quality and quantity for future generations

The results of the third question are shown in Table 3.3. Almost all respondents (98.2 per cent) indicated agreement that the quality and quantity of water in rivers, lakes, streams and aquifers should be protected for the benefit of future generations.

Table 3.3: Protection of water quality and quantity for future generations

3. The quality and quantity of water in Canterbury rivers, streams, lakes and drinking water from underground aquifers should be protected for the benefit of future generations.				
	n	**% all**	**% 1 – 5 (N = 500)**	**% combined**
Strongly agree (1)	442	88.4	88.4	98.2
Agree (2)	49	9.8	9.8	
Neither agree nor disagree (3)	8	1.6	1.6	1.6
Disagree (4)	1	0.2	0.2	0.2
Strongly disagree (5)	0	0.0	0.0	
Don't know	0	0.0	-	-
Pass	0	0.0	-	-
Total	500	100	100	100

3.2.4 Adding chlorine to drinking water

Opinion regarding the chlorination of drinking water was measured in the next question. As shown in Table 3.4, a large proportion of respondents (91.5 per cent) agreed that chlorination should be avoided. While few disagreed (1.2 per cent), a small proportion neither agreed nor disagreed (7.2 per cent).

Table 3.4: Adding chlorine to drinking water

4. The quality of water in Canterbury should be maintained or improved in order to avoid having to add chlorine to drinking water.				
	n	**% all**	**% 1 – 5 (N = 500)**	**% combined**
Strongly agree (1)	352	70.4	70.5	91.6
Agree (2)	105	21	21.0	
Neither agree nor disagree (3)	36	7.2	7.2	7.2
Disagree (4)	4	0.8	0.8	1.2
Strongly disagree (5)	2	0.4	0.4	
Don't know	1	0.2	-	-
Pass	0	0.0	-	-
Total	500	100	100	100

3.2.5 Charging for domestic supply

The fifth measure was of the opinion regarding the charging for domestic use of water. The results show that more disagreed (39.1 per cent) than agreed (36.2 per cent) that there should be charges for water above a basic allocation. Nevertheless, together with those who neither agreed nor disagreed (24.7 per cent), most respondents (60.9 per cent) did not oppose having to pay for water beyond a basic allocation.

Table 3.5: Charging for domestic supply

5. Home owners should have to pay for each litre of water they use beyond a basic allocation.				
	n	**% all**	**% 1 – 5 (N = 500)**	**% combined**
Strongly agree (1)	62	12.4	12.7	36.2
Agree (2)	115	23	23.5	
Neither agree nor disagree (3)	121	24.2	24.7	24.7
Disagree (4)	103	20.6	21.1	39.1
Strongly disagree (5)	88	17.6	18.0	
Don't know	6	1.2	-	-
Pass	5	1.0	-	-
Total	500	100	100	100

3.2.6 Charging for water supply to farmers and commercial users

Regarding charging commercial users of water, as shown in Table 3.6, the majority agreed (59.2 per cent) that farmers and commercial users should have to pay for each litre of water used. Nevertheless, 18.1 per cent disagreed.

Table 3.6: Charging for water supply to farmers and commercial users

6. Farmers using water for irrigation and other large commercial users of water should have to pay for each litre of water they use.				
	n	**% all**	**% 1 – 5 (N = 500)**	**% combined**
Strongly agree (1)	151	30.2	30.6	59.2
Agree (2)	141	28.2	28.6	
Neither agree nor disagree (3)	112	22.4	22.7	22.7
Disagree (4)	64	12.8	13.0	18.1
Strongly disagree (5)	25	5.0	5.1	
Don't know	4	0.8	-	-
Pass	3	0.6	-	-
Total	500	100	100	100

3.2.7 Intensive farming and contamination

The seventh measure of opinion recorded responses regarding whether irrigation for intensive livestock farming would lead to the contamination of drinking water supplies and poorer water quality in rivers, streams or lakes. The majority of respondents agreed (69.8 per cent), though some disagreed (11.5 per cent).

Table 3.7: Intensive farming and contamination

7. An increase in irrigation for intensive livestock farming will result in the contamination of drinking water supplies and poorer water quality in rivers, streams or lakes.				
	n	**% all**	**% 1 – 5 (N = 500)**	**% combined**
Strongly agree (1)	186	30.2	40.3	69.8
Agree (2)	136	28.2	29.5	
Neither agree nor disagree (3)	86	22.4	18.7	18.7
Disagree (4)	38	12.8	8.2	11.5
Strongly disagree (5)	15	5.0	3.3	
Don't know	36	0.8	-	-
Pass	3	0.6	-	-
Total	500	100	100	100

3.2.8 Should the community pay for clean up?

Table 3.8 shows the results of the opinion responses gathered for question eight. In terms of whether the community should not have to pay for clean up of environmental damage resulting from farming the majority agreed (83.5 per cent). Nevertheless, 6.7 per cent were of the opinion that the community should pay.

Table 3.8: Should the community pay for clean up?

8. The community should not have to pay for the clean up of environmental damage resulting from farming.				
	n	**% all**	**% 1 – 5 (N = 500)**	**% combined**
Strongly agree (1)	292	58.4	59.2	83.6
Agree (2)	120	24.0	24.3	
Neither agree nor disagree (3)	48	9.6	9.7	9.7
Disagree (4)	18	3.6	3.7	6.7
Strongly disagree (5)	15	3.0	3.0	
Don't know	4	0.8	-	-
Pass	3	0.6	-	-
Total	500	100	100	100

3.2.9 Hold on allocation of water

Table 3.9 shows the opinion of respondents regarding question 9. The question sought agreement or disagreement for a hold on allocation of water for irrigation until research had been done so as to ensure that the quality and quantity of water will not fall below acceptable standards. The majority agreed (81.1 per cent) though 11.8 per cent neither agreed nor disagreed and 7.1 per cent disagreed.

Table 3.9: Further allocation after research

9. No further water should be allocated for irrigation until research has been done and a guarantee can be given that the quality and quantity of water will not fall below acceptable standards.				
	n	**% all**	**% 1 – 5 (N = 500)**	**% combined**
Strongly agree (1)	252	50.4	51.2	81.1
Agree (2)	147	29.4	29.9	
Neither agree nor disagree (3)	58	11.6	11.8	11.8
Disagree (4)	28	5.6	5.7	7.1
Strongly disagree (5)	7	1.4	1.4	
Don't know	6	1.2	-	-
Pass	2	0.4	-	-
Total	500	100	100	100

3.2.10 Benefits and acceptance of effects on freshwater

The statement for the tenth measure of opinion began with the proposition that the community may benefit from the use of irrigation water for farming and then recorded willingness to accept effects on drinking water supplies, rivers, streams and lakes. Most (56.7 per cent) indicated their disagreement or unwillingness to accept the effects (Table 3.10). Nevertheless, given benefits to the community more than one quarter of the respondents (26.4 per cent) agreed it acceptable for the community to accept the effects of farming on drinking water supplies, rivers, streams and lakes.

Table 3.10: Benefits and acceptance of affects on freshwater

10. If the Canterbury economy is able to benefit from the use of irrigation water for farming then the community should be willing to accept the effects on drinking water supplies, rivers, streams and lakes.				
	n	**% all**	**% 1 – 5 (N = 500)**	**% combined**
Strongly agree (1)	32	6.4	6.6	26.4
Agree (2)	96	19.2	19.8	
Neither agree nor disagree (3)	82	16.4	16.9	16.9
Disagree (4)	152	30.4	31.3	56.7
Strongly disagree (5)	123	24.6	25.4	
Don't know	10	2.0	-	-
Pass	5	1.0	-	-
Total	500	100	100	100

3.2.11 Legislation and protection of freshwater

The survey asked respondents their opinion regarding whether current legislation protects drinking water supplies and rivers, streams and lakes from contamination. There was a large number of 'don't know' responses (33.8 per cent). Nevertheless, for those who provided their opinion, just over half agreed (51 per cent) that the legislation provides protection while just under one third disagreed (31.7 per cent).

Table 3.11: Legislation and protection of freshwater

11. Current legislation protects drinking water supplies and rivers, streams and lakes from contamination.				
	n	**% all**	**% 1 – 5 (N = 500)**	**% combined**
Strongly agree (1)	57	11.4	19.0	51.0
Agree (2)	96	19.2	32.0	
Neither agree nor disagree (3)	82	16.4	27.3	27.3
Disagree (4)	65	13.0	21.7	31.7
Strongly disagree (5)	30	6.0	10.0	
Don't know	169	33.8	-	-
Pass	1	0.2	-	-
Total	500	100	100	100

3.2.12 Assessment of management by Environment Canterbury

The second to last measure was an assessment of the quality of management of freshwater by Environment Canterbury using the plain language of has it 'done its job'. As shown in Table 3.12, for those who gave an opinion more agreed (41.5 per cent) than disagreed (30.1 per cent) and there was a reasonably large proportion of those with no strong opinion (neither agree nor disagree – 28.5 per cent).

Table 3.12: Assessment of management by Environment Canterbury

12. Environment Canterbury, which is responsible for water management, has done its job of protecting drinking water supplies, rivers, streams and lakes from contamination.				
	n	**% all**	**% 1 – 5 (N = 500)**	**% combined**
Strongly agree (1)	38	7.6	8.8	41.4
Agree (2)	141	28.2	32.6	
Neither agree nor disagree (3)	123	24.6	28.5	28.5
Disagree (4)	91	18.2	21.1	30.1
Strongly disagree (5)	39	7.8	9.0	
Don't know	66	13.2	-	-
Pass	2	0.4	-	-
Total	500	100	100	100

3.2.13 Representation of community views and interests

The last question measured a different aspect of management by measuring the opinion of respondents regarding whether local and regional councillors have adequately represented the views and interests of the community on water management. As the results show, for those with an opinion just under one third agreed (31.4 per cent) and just over one third disagreed (34.4 per cent) with the remainder having no strong opinion. Also of note, just over one fifth of the 500 respondents (20.8 per cent) said they 'don't know'.

Table 3.13: Representation of community views and interests

13. Local and regional councillors have adequately represented the views and interests of the Canterbury public on management of water.				
	n	**% all**	**% 1 – 5 (N = 500)**	**% combined**
Strongly agree (1)	19	3.8	4.8	31.4
Agree (2)	105	21.0	26.6	
Neither agree nor disagree (3)	135	27.0	34.3	34.4
Disagree (4)	97	19.4	24.6	34.2
Strongly disagree (5)	38	7.6	9.6	
Don't know	104	20.8	-	-
Pass	2	0.4	-	-
Total	500	100	100	100

3.2.14 Differences in opinion based on age, income and gender

To provide further information about the opinion responses demographic data (shown in Table 2.1) was cross tabulated with the opinion responses and subjected to chi-square tests to investigate differences in terms of age, income and gender. The tests were between each demographic measure and the opinion responses in terms of the categories of (1) strongly agree and agree (2) neither agree nor disagree and (3) disagree and strongly disagree. The results of these tests are shown in Table 3.14.

Note that tests were not undertaken for questions one to four as there were insufficient numbers of disagree and strongly disagree responses. Also note that blank cells in the table are where the tests could not be performed because of low numbers whereas ‘ns’ shows where there were sufficient numbers and no significant difference was found.

As shown, there were differences in terms of gender responses to the statement ‘Farmers using water for irrigation and other large commercial users of water should have to pay for each litre of water they use’. Of the males, more (69.9 per cent) agreed or strongly agreed compared with the proportion of the female respondents (58.2 per cent) who agreed or strongly agreed.

Further differences were found for responses to question 12 based on age and income. This was the measurement of responses to the statement ‘Environment Canterbury, which is responsible for water management, has done its job of protecting drinking water supplies, rivers, streams and lakes from contamination’. Proportionately more of the youngest (18 to 29) and the oldest respondents (70 or more) agreed or strongly agreed (70 per cent and 55 per cent respectively), whereas the proportion of agreement for those in other age groups was less than 39 per cent. In addition, there was a smaller proportion of those in agreement or strong agreement for those with income of more than $70,000 (27.5 per cent). This was in comparison with those of other income categories who either agreed or strongly agreed (less than $20,000 - 51.1 per cent; $20,001 to $40,000 - 45.3 per cent; $40,001 to $70,000 – 41.5 per cent).

Question 13 took responses to the statement ‘Local and regional councillors have adequately represented the views and interests of the Canterbury public on management of water’. Proportionately more of the youngest (18 to 29) and the oldest respondents (70 or more) agreed (57.7 per cent and 41.7 per cent respectively). For the other age groups the proportion of those in agreement was less than 33 per cent.

Table 3.14: Differences in opinion based on age, income and gender

Question number	Age	Income	Gender
5. Home owners should have to pay for each litre of water they use beyond a basic allocation.	ns	ns	Ns
6. Farmers using water for irrigation and other large commercial users of water should have to pay for each litre of water they use.	ns	ns	Ns
7. An increase in irrigation for intensive livestock farming will result in the contamination of drinking water supplies and poorer water quality in rivers, streams or lakes.	ns	ns	$p < 0.01$
8. The community should not have to pay for the clean up of environmental damage resulting from farming.		ns	Ns
9. No further water should be allocated for irrigation until research has been done and a guarantee can be given that the quality and quantity of water will not fall below acceptable standards.		ns	Ns
10. If the Canterbury economy is able to benefit from the use of irrigation water for farming then the community should be willing to accept the effects on drinking water supplies, rivers, streams and lakes.	ns	ns	Ns
11. Current legislation protects drinking water supplies and rivers, streams and lakes from contamination.	ns	ns	Ns
12. Environment Canterbury, which is responsible for water management, has done its job of protecting drinking water supplies, rivers, streams and lakes from contamination.	$p < 0.01$	$p < 0.05$	Ns
13. Local and regional councillors have adequately represented the views and interests of the Canterbury public on management of water.	$p < 0.05$	ns	Ns

Note: Results of tests for questions 1 to 4 are not shown due to insufficient numbers in one or more cells in all cross tabulations. Blank cells are where results are not shown due to low numbers in one or more cells. The notation 'ns' shows where there was no evidence of significant difference, whereas the p values show evidence of differences.

3.3 The Lincoln University survey results

3.3.1 Quality of water in Canterbury rivers and streams

The opinion of Lincoln University survey respondents regarding quality of water in Canterbury rivers and streams is shown in Table 3.18. Of those who gave their opinion most judged water quality to be good or extremely good in 2008 (51.4 per cent), whereas a smaller proportion had judged it good or extremely good in 2004 (36.7 per cent). However, overall there was no significant difference between the 2004 and 2008 responses (chi square, $p > 0.05$). There was also no significant difference between Canterbury responses and those from respondents in other regions for both 2004 and 2008 (chi square, $p > 0.05$).

Table 3.15: Quality of water in Canterbury rivers and streams

1. The quality of water in my region's rivers and steams						
Response		**n**	**% all**	**% 1 – 5**	**% combined**	**% 1 - 5 other regions**
2004	**Extremely good (1)**	7	5.9	6.4	36.7	5.5
	Good (2)	33	28.0	30.3		28.5
	Adequate (3)	41	34.7	37.6	37.6	37.5
	Poor (4)	22	18.6	20.2	25.7	25.4
	Extremely poor (5)	6	5.1	5.5		3.1
	Don't know	9	7.6	-	-	-
	Total	118	100	100	100	100
2008	**Extremely good (1)**	14	12.5	13.3	51.4	7.2
	Good (2)	40	35.7	38.1		33.0
	Adequate (3)	34	30.4	32.4	32.4	36.6
	Poor (4)	14	12.5	13.3	16.2	19.0
	Extremely poor (5)	3	2.7	2.9		4.1
	Don't know	7	6.3	-	--	-
	Total	112	100	100	100	100

3.3.2 Quality of water in aquifers

The opinion of respondents regarding quality of water in Canterbury aquifers is shown in Table 3.16 with most judging water quality to be good or extremely good in both 2004 (63.3 per cent) and 2008 (66.3 per cent). Of note, there was a reasonable proportion of 'don't know' responses. These were lower in 2008 (9.0 per cent) than in 2004 (15.1 per cent). There was no significant difference between the 2004 and 2008 responses (chi square, $p > 0.05$). However, there were significant differences between Canterbury responses and those from respondents in other regions for both 2004 and 2008 (chi square, $p < 0.01$). As can be seen Canterbury respondents judged the quality of water in their aquifers to be of better quality than had those from other regions.

Table 3.16: Quality of water in Canterbury aquifers

2. The quality of water in my region's aquifers						
Response		**n**	**% all**	**% 1 – 5**	**% combined**	**% 1 - 5 other regions**
2004	**Extremely good (1)**	27	22.7	26.7	63.3	7.3
	Good (2)	37	31.1	36.6		37.7
	Adequate (3)	30	25.2	29.7	29.7	40.1
	Poor (4)	6	5.0	5.9	6.9	13.1
	Extremely poor (5)	1	.8	1.0		1.8
	Don't know	18	15.1	-	-	-
	Total	119	100	100	100	100
2008	**Extremely good (1)**	26	23.4	25.7	66.3	13.3
	Good (2)	41	36.9	40.6		35.4
	Adequate (3)	26	23.4	25.7	25.7	37.2
	Poor (4)	5	4.5	5.0	8	11.9
	Extremely poor (5)	3	2.7	3.0		2.2
	Don't know	10	9.0	-	-	-
	Total	111	100	100	100	100

3.3.3 Quality of water in lakes

Opinion regarding quality of water in Canterbury lakes is shown in Table 3.17. Of those who gave their opinion more judged water quality to be good or extremely good in 2004 (42.6 per cent), and 2008 (48.5 per cent), compared to those who regarded condition to be poor or extremely poor. There was no significant difference between the 2004 and 2008 responses (chi square, $p < 0.05$). However, there was a significant difference between Canterbury responses and those from respondents in other regions for 2004 (chi square, $p < 0.05$) and for 2008 there was evidence of a marginal significant difference (chi square, $p < 0.07$). Canterbury respondents judged the quality of water in their lakes to be of better quality than had those from other regions.

Table 3.17: Quality of water in Canterbury lakes

3. The quality of water in my region's lakes						
Response		**n**	**% all**	**% 1 – 5**	**% combined**	**% 1 - 5 other regions**
2004	**Extremely good (1)**	7	5.9	6.5	42.6	4.8
	Good (2)	39	32.8	36.1		26.6
	Adequate (3)	41	34.5	38.0	38	36.9
	Poor (4)	20	16.8	18.5	19.4	25.6
	Extremely poor (5)	1	.8	.9		6.1
	Don't know	11	9.2	-	-	-
	Total	119	100	100	100	100
2008	**Extremely good (1)**	10	9.1	10.1	48.5	8.0
	Good (2)	38	34.5	38.4		31.4
	Adequate (3)	40	36.4	40.4	40.4	40.0
	Poor (4)	10	9.1	10.1	11.1	16.2
	Extremely poor (5)	1	.9	1.0		4.4
	Don't know	11	10.0	-	-	-
	Total	110	100	100	100	100

3.3.4 Environment Canterbury management of rivers and streams

Table 3.18 shows the opinion of respondents from the 2008 survey regarding regional council management of rivers and streams. In terms of combined percentage more considered management to be good (37.0 per cent) compared to those who considered it to be poor (22.0 per cent). There was no significant difference between the Canterbury respondents' opinion of their regional council and the opinion of other respondents regarding council management for their region (chi square, $p > 0.05$).

Table 3.18: Environment Canterbury management of rivers and streams

3. My Regional Council's management of rivers and streams						
Response		**n**	**% all**	**% 1 – 5**	**% combined**	**% 1 - 5 other regions**
2008	**Extremely good (1)**	5	4.5	5.0	37.0	3.8
	Good (2)	32	29.1	32.0		31.3
	Adequate (3)	41	37.3	41.0	41.0	44.4
	Poor (4)	19	17.3	19.0	22.0	17.7
	Extremely poor (5)	3	2.7	3.0		2.8
	Don't know	10	9.1	-	-	-
	Total	110	100	100	100	100

3.3.5 Environment Canterbury management of aquifers

Table 3.19 shows the opinion of respondents from the 2008 survey regarding regional council management of aquifers. In terms of combined percentage more considered management to be good (37.0 per cent) compared to those who considered it to be poor (22.0 per cent). There was no significant difference between the Canterbury respondents' opinion of their regional council and the opinion of other respondents regarding council management for their region (chi square, $p > 0.05$).

Table 3.19: Environment Canterbury management of aquifers

My Regional council's management of aquifers						
Response		**n**	**% all**	**% 1 – 5**	**% combined**	**% 1 - 5 other regions**
2008	**Extremely good (1)**	5	4.5	5.3	36.8	6.1
	Good (2)	30	27.3	31.6		29.6
	Adequate (3)	41	37.3	43.2	43.2	44.0
	Poor (4)	12	10.9	12.6	20.0	17.4
	Extremely poor (5)	7	6.4	7.4		2.8
	Don't know	15	13.6	-	-	-
	Total	110	100	100	100	100

3.3.6 Environment Canterbury management of lakes

The results of the measure of opinion regarding regional council management of lakes are shown in Table 3.20. While a reasonably large proportion did not know (13.5 per cent), of those with an opinion most considered management to be adequate (55.2 per cent). Nevertheless, more judged management of lakes to be good (33.3 per cent) compared to those who judged it to be poor (11.5 per cent). There was no significant difference between the Canterbury respondents' opinion of their regional council and the opinion of other respondents regarding council management for their region (chi square, $p > 0.05$).

Table 3.20: Environment Canterbury management of lakes

My Regional council's management of lakes						
Response		**n**	**% all**	**% 1 – 5**	**% combined**	**% 1 - 5 other regions**
2008	**Extremely good (1)**	6	5.4	6.3	33.3	4.3
	Good (2)	26	23.4	27.1		30.3
	Adequate (3)	53	47.7	55.2	55.2	47.4
	Poor (4)	11	9.9	11.5	11.5	15.5
	Extremely poor (5)	0	0.0	0.0		2.5
	Don't know	15	13.5	-	-	-
	Total	111	100	100	100	100

3.3.7 MfE policy making for rivers and streams

The results of the measure of adequacy of policy making by the MfE for rivers and streams presented in Table 3.21 show that a large proportion indicated they did not know (26.8 per cent). Of those with an opinion most considered policy making to be adequate (51.2 per cent), while the proportion of those judging it to be good (28.0 per cent) exceeded those who considered it was poor (20.7 per cent). There was no significant difference between the Canterbury respondents' opinion of this aspect of policy making by the MfE and the opinion of those from other regions (chi square, $p > 0.05$).

Table 3.21: MfE policy making for rivers and streams

4. MfE policy making for rivers and streams						
Response		**n**	**% all**	**% 1 – 5**	**% combined**	**% 1 - 5 other regions**
2008	**Extremely good (1)**	3	2.7	3.7	28.0	3.1
	Good (2)	20	17.9	24.4		29.3
	Adequate (3)	42	37.5	51.2	51.2	45.2
	Poor (4)	15	13.4	18.3	20.7	19.0
	Extremely poor (5)	2	1.8	2.4		3.3
	Don't know	30	26.8	-	-	-
	Total	112	100	100	100	100

3.3.8 MfE policy making for aquifers

The results of the measure of adequacy of policy making by the MfE for aquifers are shown in Table 3.22. A large proportion indicated they did not know (27.7 per cent). Of those with an opinion most considered policy making to be adequate (51.9 per cent) and there was a reasonably even split between those judging it good (24.7 per cent) and poor (23.5 per cent). There was no significant difference between the Canterbury respondents' opinion of the policy making by the MfE and the opinion of respondents from other regions (chi square, $p > 0.05$).

Table 3.22: MfE policy making for aquifers

5. MfE policy making for aquifers						
Response		**n**	**% all**	**% 1 – 5**	**% combined**	**% 1 - 5 other regions**
2008	**Extremely good (1)**	3	2.7	3.7	24.7	3.3
	Good (2)	17	15.2	21.0		28.0
	Adequate (3)	42	37.5	51.9	51.9	44.8
	Poor (4)	16	14.3	19.8	23.5	20.1
	Extremely poor (5)	3	2.7	3.7		3.8
	Don't know	31	27.7	-	-	-
	Total	112	100	100	100	100

3.3.9 MfE policy making for lakes

The results of the measure of opinion regarding MfE policy making for lakes are shown in Table 3.23. While a large proportion did not know (28.6 per cent), of those with an opinion most considered policy making to be adequate (56.3 per cent). Nevertheless, more judged policy making be good (27.5 per cent) compared to those who judged it to be poor (16.3 per cent). There was no significant difference between the Canterbury respondents' opinion of this aspect of MfE policy making and the opinion of respondents from other regions (chi square, $p > 0.05$).

Table 3.23: MfE policy making for lakes

6. MfE policy making for lakes						
Response		**n**	**% All**	**% 1 – 5**	**% combined**	**% 1 - 5 other regions**
2008	**Extremely good (1)**	3	2.7	3.8	27.5	3.5
	Good (2)	19	17.0	23.8		27.2
	Adequate (3)	45	40.2	56.3	56.3	45.6
	Poor (4)	12	10.7	15.0	16.3	19.6
	Extremely poor (5)	1	0.9	1.3		4.0
	Don't know	32	28.6	-	-	-
	Total	112	100	100	100	100

3.3.10 Taking water from rivers for irrigation

The opinion of Lincoln survey respondents regarding the taking of water for irrigation even if there was a negative impact on fisheries in both 2004 and 2008 is shown in Table 3.24. Of those with an opinion the majority disagreed or strongly disagreed with the taking of water in both 2004 (67.5 per cent) and 2008 (68.9 per cent). There was no significant difference between the 2004 and 2008 responses (chi square, $p > 0.05$). In addition, there was no significant difference Canterbury responses and those from other regions for both 2004 and 2008 (chi square, $p > 0.05$).

Table 3.24: Taking water from rivers for irrigation

7. More water should be taken from large rivers for irrigation even if there is a negative impact on freshwater fisheries						
Response		**n**	**% all**	**% 1 – 5**	**% combined**	**% 1 - 5 other regions**
2004	**Strongly agree (1)**	5	4.3	4.5	12.6	0.9
	Agree (2)	9	7.7	8.1		15.9
	Neither agree Nor disagree (3)	22	18.8	19.8	19.8	19.9
	Disagree (4)	41	35.0	36.9	67.5	44.7
	Strongly disagree (5)	34	29.1	30.6		18.7
	Don't know	6	5.1	-	-	-
	Total	117	100	100	100	100
2008	**Strongly agree (1)**	3	2.8	2.8	17.0	4.4
	Agree (2)	15	13.8	14.2		20.9
	Neither agree Nor disagree (3)	15	13.8	14.2	14.2	20.9
	Disagree (4)	37	33.9	34.9	68.9	37.8
	Strongly disagree (5)	36	33.0	34.0		16.0
	Don't know	3	2.8	-	-	-
	Total	109	100	100	100	100

3.3.11 Quality of water in small lowland streams

Opinion regarding whether small lowland streams had high quality water is shown in Table 3.25. The majority disagreed or strongly disagreed in both 2004 (63.2 per cent) and 2008 (54.9 per cent). There was a significant difference between the 2004 and 2008 responses (chi square, $p < 0.05$). As can be seen a smaller proportion agreed or strongly agreed that small lowland streams had high quality water in 2008 (20.5 per cent), compared to 2004 (24.1 per cent). There was also a marginal significant difference between Canterbury responses and those from other regions for 2004 (chi square, $p < 0.08$) and a significant difference for those measured in 2008 (chi square, $p < 0.05$). For both years, there was a higher proportion of Canterbury respondents disagreeing that water in small lowland streams were of good quality.

Table 3.25: Quality of water in small lowland streams

8. Small lowland streams in my region have high quality water						
Response		**n**	**% all**	**% 1 – 5**	**% combined**	**% 1 - 5 other regions**
2004	**Strongly agree (1)**	1	0.9	1.1	24.1	1.1
	Agree (2)	20	17.1	23.0		24.4
	Neither agree Nor disagree (3)	11	9.4	12.6	12.6	22.4
	Disagree (4)	40	34.2	46.0		40.7
	Strongly disagree (5)	15	12.8	17.2	63.2	11.4
	Don't know	30	25.6	-	-	-
	Total	117	100	100	100	100
2008	**Strongly agree (1)**	2	1.8	2.4	20.5	2.4
	Agree (2)	15	13.6	18.1		26.5
	Neither agree Nor disagree (3)	17	15.5	20.5	20.5	27.2
	Disagree (4)	37	33.6	40.5	54.9	34.9
	Strongly disagree (5)	12	10.9	14.5		9.1
	Don't know	27	24.5	-	-	-
	Total	110	100	100	100	100

3.3.12 Quality of management of small lowland streams

The opinions whether small lowland streams in Canterbury were well managed in both 2004 and 2008 are shown in Table 3.26. Of those with an opinion a large proportion disagreed or strongly disagreed that the streams were well managed in both 2004 (48.8 per cent) and 2008 (38.5 per cent), although a smaller proportion were critical of management in 2008. However, there was no significant difference between the 2004 and 2008 responses (chi square, $p > 0.05$). There was no significant difference Canterbury responses and those from respondents in other regions for both 2004 and 2008 (chi square, $p > 0.05$).

Table 3.26: Quality of management of small lowland streams

9. Small lowland streams in my region are well managed						
Response		**n**	**% all**	**% 1 – 5**	**% combined**	**% 1 - 5 other regions**
2004	**Strongly agree (1)**	0	0.0	0.0	22	.7
	Agree (2)	18	15.4	22.0		22.9
	Neither agree Nor disagree (3)	24	20.5	29.3	29.3	33.4
	Disagree (4)	29	24.8	35.4	48.8	34.3
	Strongly disagree (5)	11	9.4	13.4		8.7
	Don't know	35	29.9	-	-	-
	Total	117	100	100	100	100
2008	**Strongly agree (1)**	2	1.8	2.4	30.5	2.6
	Agree (2)	23	20.9	28.0		27.7
	Neither agree Nor disagree (3)	23	20.9	28.0	28	31.9
	Disagree (4)	26	23.6	28.8	38.5	31.2
	Strongly disagree (5)	8	7.3	9.8		6.6
	Don't know	28	25.5	-	-	-
	Total	110	100	100	100	100

3.3.13 Taking water from small lowland streams for irrigation

Table 3.27 shows opinions regarding the taking of water from small lowland streams for irrigation even if there is a negative impact on freshwater fisheries. Of those with an opinion in both 2004 and 2008 a large proportion disagreed or strongly disagreed with the taking of water (respectively 86.4 and 73.7 per cent), There was a significant difference between the 2004 and 2008 responses (chi square, $p < 0.01$) with a smaller proportion disagreeing or strongly disagreeing in 2008. There was no significant difference Canterbury responses and those other regions for both 2004 and 2008 (chi square, $p < 0.05$).

Table 3.27: Taking water from small lowland streams for irrigation

10. More water should be taken from small lowland streams for irrigation even if there is a negative impact on freshwater fisheries						
Response		**n**	**% all**	**% 1 – 5**	**% combined**	**% 1 - 5 other regions**
2004	**Strongly agree (1)**	2	1.7	1.8	3.6	.7
	Agree (2)	2	1.7	1.8		5.4
	Neither agree Nor disagree (3)	11	9.2	9.9	9.9	10.6
	Disagree (4)	49	41.2	44.1		57.2
	Strongly disagree (5)	47	39.5	42.3	86.4	26.1
	Don't know	8	6.7	-	-	-
	Total	119	100	100	100	100
2008	**Strongly agree (1)**	1	0.9	1.0	8.9	1.3
	Agree (2)	8	7.3	7.9		7.3
	Neither agree Nor disagree (3)	14	12.8	13.9	13.9	15.0
	Disagree (4)	43	39.4	39.0	73.7	52.4
	Strongly disagree (5)	35	32.1	34.7		24.0
	Don't know	8	7.3	-	-	-
	Total	109	100	100	100	100

3.3.14 Condition of small lowland streams

The opinion of survey respondents regarding the condition of small lowland streams is shown in Table 3.28. In both 2004 (55.1 per cent), and 2008 (42.5 per cent), a large proportion disagreed or strongly disagreed that small lowland streams in Canterbury were in good condition. There was a significant difference between the 2004 and 2008 responses (chi square, $p > 0.001$), as can be seen a smaller proportion disagreed or strongly disagreed in 2008 compared to 2004. There was no significant difference between Canterbury responses and those from respondents in other regions for both 2004 and 2008 (chi square, $p > 0.05$).

Table 3.28: Conditions of small lowland streams

11. Small lowland streams in my region are in good condition						
Response		**n**	**% all**	**% 1 – 5**	**% combined**	**% 1 - 5 other regions**
2004	**Strongly agree (1)**	1	.8	1.1	21.8	.9
	Agree (2)	18	15.1	20.7		28.4
	Neither agree Nor disagree (3)	20	16.8	23.0	23	21.4
	Disagree (4)	33	27.7	37.9	55.1	39.7
	Strongly disagree (5)	15	12.6	17.2		9.6
	Don't know	32	26.9	-	-	-
	Total	119	100	100	100	100
2008	**Strongly agree (1)**	0	0	0.0	28.7	1.6
	Agree (2)	25	22.7	28.7		29.8
	Neither agree Nor disagree (3)	25	22.7	28.7	28.7	30.1
	Disagree (4)	29	26.4	33.3	42.5	29.6
	Strongly disagree (5)	8	7.3	9.2		8.9
	Don't know	23	20.9	-	-	-
	Total	110	100	100	100	100

3.3.15 Damage to small lowland streams from dairy farming

The opinion of survey respondents regarding damage to small lowland streams from dairy farming is shown in Table 3.29. Of those with an opinion a large proportion disagreed or strongly disagreed in both 2004 (55.1 per cent), and 2008 (42.5 per cent) that damage had not occurred. However, while there was a smaller proportion in 2008, there was no significant difference between the 2004 and 2008 responses (chi square, $p > 0.05$). Nevertheless, there was a significant difference between Canterbury responses and those from respondents in other regions for 2004 (chi square, $p < 0.05$) and a marginal significant difference for 2008 (chi square, $p < 0.06$). As can be seen there was a greater proportion of Canterbury respondents strongly disagreeing that no damage had been done in both years compared to respondences from other regions.

Table 3.29: Damage to small lowland streams from dairy farming

13. Water quality in small lowland streams in my region has not been damaged by dairy farming						
Response		**n**	**% all**	**% 1 – 5**	**% combined**	**% 1 - 5 other regions**
2004	**Strongly agree (1)**	1	.8	1.3	15.2	1.8
	Agree (2)	11	9.3	13.9		24.8
	Neither agree Nor disagree (3)	8	6.8	10.1	10.1	19.0
	Disagree (4)	30	25.4	38.0	74.7	38.1
	Strongly disagree (5)	29	24.6	36.7		16.3
	Don't know	39	33.1	-	-	-
	Total	118	100	100	100	100
2008	**Strongly agree (1)**	2	1.8	2.4	19.3	3.5
	Agree (2)	14	12.7	16.9		26.1
	Neither agree Nor disagree (3)	12	10.9	14.5	14.5	18.9
	Disagree (4)	35	31.8	38.3	62.4	33.9
	Strongly disagree (5)	20	18.2	24.1		17.6
	Don't know	27	24.5	-	-	-
	Total	110	100	100	100	100

3.3.16 Taking of water from aquifers

Opinions regarding the taking of water from aquifers are shown in Table 3.30. Of those with an opinion a large proportion disagreed or strongly disagreed with the taking of more water in both 2004 (56.7 per cent), and 2008 (58.7 per cent). There was no significant difference between the 2004 and 2008 responses (chi square, $p > 0.05$). Of note, there were a large proportion of 'don't know' responses for both years. In addition, there was a significant difference between Canterbury responses and those from other regions in both 2004 and 2008 (chi square, $p < 0.001$). In 2008, for example, for Canterbury there was a smaller proportion of those who either disagree (36.1 per cent) or strongly disagreed (22.6 per cent) compared to other regions (respectively, 28.5 and 10.5 per cent).

Table 3.30: Taking of water from aquifers

14. More water should be taken from aquifers in my region						
Response		**n**	**% all**	**% 1 – 5**	**% combined**	**% 1 - 5 other regions**
2004	**Strongly agree (1)**	3	2.5	3.3	16.6	4.4
	Agree (2)	12	10.1	13.3		28.2
	Neither agree nor disagree (3)	24	20.2	26.7	26.7	32.3
	Disagree (4)	35	29.4	38.9	56.7	26.2
	Strongly disagree (5)	16	13.4	17.8		9.0
	Don't know	29	24.4	-	-	-
	Total	119	100	100	100	100
2008	**Strongly agree (1)**	5	4.5	5.4	17.2	2.7
	Agree (2)	11	10.0	11.8		26.9
	Neither agree nor disagree (3)	19	17.3	20.4	20.4	31.3
	Disagree (4)	37	33.6	36.1	58.7	28.5
	Strongly disagree (5)	21	19.1	22.6		10.5
	Don't know	17	15.5	-	-	-
	Total	110	100	100	100	100

3.3.17 Differences in opinion based on age, income and gender

To provide further information about the opinion responses from the Lincoln surveys demographic data (shown in Table 2.2) was cross tabulated with the opinion responses and subjected to chi-square tests to investigate differences in terms of age, income and gender. The tests were between each demographic measure and the opinion responses in terms of the categories of (1) strongly agree and agree (2) neither agree nor disagree and (3) disagree and strongly disagree, or categories of (1) extremely good and good (2) adequate and (3) poor and extremely poor. The results of these tests showed that there was no significant difference based on gender (chi square, $p > 0.05$). Tests for income and age could not be conducted because of low numbers in cells in cross tabulation.

Chapter 4
Discussion and Conclusion

4.1 Introduction

This chapter presents and discusses the research findings. The chapter begins with consideration of representativeness of the survey samples. The findings are then reviewed followed by consideration of implications and recommendations regarding freshwater management.

4.2 Representativeness

In tests for representativeness each sample was compared to census results and differences were identified. For the telephone survey, comparison with census results found that more females than males had responded to the survey. There was also a greater proportion of younger and older respondents and fewer responses were received from those with low incomes. For respondents to the Lincoln postal survey compared to census results there was a smaller proportion of respondents to the survey in the younger age group of under 29. There were also smaller proportions of those in the lowest income group. Also, compared to census results it was found that fewer males than females responded to the 2004 survey and proportionately more males responded in 2008.

It is not uncommon in survey research for some people with certain demographic characteristics to be over or under represented. This can cause problems for representativeness where the opinion of those surveyed differs from that of the wider population. In this research it was shown for the telephone survey that only a small proportion of those who did not participate were not interested in the topic. This suggests the telephone survey results were not biased by the gathering of responses from those with a strong opinion.

Regarding the telephone survey, from consideration of the differences with census data together with the results comparing age, income and gender with the opinion data it follows that the Canterbury public would be slightly more in agreement that farmers and commercial users be charged for water use than is shown in the survey results. The results also showed differences in opinion between age groups for two other measures of opinion but as the youngest respondents were under represented and oldest respondents were over represented it is less likely that the overall results fail to accurately represent the opinion of the Canterbury public. In addition, the results showed that those with higher income were less positive about the performance of Environment Canterbury and the ability of councillors to represent public views and interests. As there were proportionately more with higher income in the telephone survey sample compared to census results, the views of the Canterbury public are likely to be slightly more positive regarding the job done by Environment Canterbury and the representation of public views by councillors than shown in the results.

As no differences were found based on gender for the opinion responses to the postal survey, in this respect the opinion results were unbiased.

4.3 Summary and discussion of findings

4.3.1 The Canterbury telephone survey

The telephone survey served to show that the public of Canterbury wanted water to be of a suitable standard for swimming and other forms of recreation. It was also expected that each home should have a good supply of clean, safe and inexpensive water and that water quality and quantity be protected for future generations. There were also strong objections to adding chlorine to drinking water. While it would seem unlikely for the public to think otherwise, the survey served to record opinion that would otherwise be merely presumed.

There was a range of opinions regarding charging for water for domestic use. In the Hurunui District such charging is already applied and in other areas such as Christchurch accurate metering has been installed that would enable this form of charging. The survey results show that most domestic users would not object to charging for water beyond a basic allocation. There was support for the proposal that farmers and commercial users should have to pay for each litre of water used.

The majority of the Canterbury public can be expected to agree that irrigation for intensive livestock farming would lead to contamination of drinking water supplies and poorer water quality in rivers, streams or lakes. There is little public support for the community paying for the clean up of environmental damage resulting from farming. This suggests that the predominant public view would be that farmers pay for environmental damage from farming.

While approximately seven per cent would disagree, the majority of the Canterbury public would support a hold on allocation of water for irrigation until further research had been done.

While the community may benefit to some degree from an increase in intensive farming, most are unwilling to accept effects on drinking water supplies, rivers, streams and lakes. Nevertheless, more than one quarter would find the effects acceptable given the community receive some benefit.

It is apparent that many lack enough knowledge of relevant legislation to judge its effectiveness for freshwater management. Nevertheless, for those with an opinion approximately half would consider it provides for adequate protection while just under one third would disagree. More approve than disapprove of the performance of Environment Canterbury in managing freshwater. In addition, while approximately one fifth feel they lack the knowledge to offer an opinion, of those with a view approximately one third would agree that local and regional councillors adequately represent of the views and interests of the community. There is nevertheless a fairly even split of opinion as approximately one third would judge representation to be less than adequate.

4.3.2 The Lincoln University postal survey

Based on the opinion of the Lincoln survey respondents, more agree that the quality of water in Canterbury rivers and streams is good than think otherwise. In addition, those in Canterbury judged water in their rivers and streams to be of better quality than had those from other regions. Also, while many may not know, most also judged water quality in aquifers to be good and those in Canterbury also judged the quality of water in their aquifers to be of better than had those from other regions. More judged water quality in lakes to be good than bad and, similar to the other assessments of water quality, those in Canterbury also

judged the water in their lakes to be of better quality compared to those from other regions. Overall, it was found that more of those from Canterbury judged their sources of water to be of good quality than had those from other regions.

In terms of management more considered management by Environment Canterbury to be good rather than poor for rivers and streams and aquifers. Also noticeably more approved of the management of lakes by Environment Canterbury. In addition, opinions regarding regional management were similarly held by those of other regions. Similarly, while many did not know about MfE policy making, approximately twice as many indicated approval compared to disapproval regarding policy making for rivers and streams, aquifers and lakes. This level of approval was similarly held by those from other regions.

Regarding the taking of more water for irrigation even if it has a negative effect on fisheries, the majority disapproved and there was a similar proportion of disapproval for those from other regions. The majority also disagreed that small lowland streams in Canterbury had high quality water and this opinion was more widely held in Canterbury compared to other regions. A large proportion disagreed that small lowland streams were well managed with a similar opinion held by those in other regions. Many disapproved of taking water from small lowland streams for irrigation in Canterbury and a large proportion disagreed that the condition of water in small lowland streams was good. In relation to a possible cause of damage to small lowland streams, a large proportion from Canterbury disagreed that dairy farming did not cause damage. In other regions the opinion was more widely held that dairy farming damaged small lowland streams.

Finally a large proportion did not know about whether more water should be taken from aquifers. Nevertheless, those with an opinion disagreed with the taking of more water. While it is likely that other regions rely to a greater or lesser extent on aquifers for their water, Canterbury had a smaller proportion disagreeing that more water should be taken.

4.4 Implications

The research has a number of implications for the management of freshwater in Canterbury. First, the Canterbury public has strong expectations that water be suitable for swimming and other forms of recreation, that each home should have a good supply of clean, safe and inexpensive water, and that water quality and quantity be protected for future generations. Given the findings the Canterbury public would be readily supportive of these being key objectives in the management of freshwater.

The widely held objections to adding chlorine to drinking water indicate that the maintenance of water sources that do not require treatment would be a priority supported by the public. In consequence, proposals to use water that risk adverse effects on clean sources of water would be of public concern. In addition, while aquifer water quality is generally considered to be good it appears to be recognised that there are limits to the taking of water from aquifers. There are then a number of recognised threats to the water supply. First, aquifers may be damaged by contamination from farming. Second, the amount of water that can be taken from aquifers is limited and more water from other possibly less pure sources will eventually be required. There is, therefore, a need to both protect and conserve aquifer water supplies and conserve and protect other current and future water supplies from contamination. In this regard, all else being equal, the taking of water for irrigation that facilitates more intensive agriculture and causes damage to clean water sources would not be acceptable. Indeed, the majority is of the view that irrigation leads to the contamination of drinking water supplies and poorer water quality in rivers, streams or lakes. In addition, as shown by the Lincoln

surveys, the majority disapprove of the taking of water from rivers for irrigation even if there is a negative effect on fisheries and disapprove of the taking of water for irrigation from small lowland streams. More judge condition of water in rivers and streams to be good than poor. However, there is a good deal of concern about the condition of water in small lowland streams, which are necessarily physically linked to other water resources. Together with the general concern and disapproval of taking water for irrigation it follows that it is necessary to give detailed consideration to policy and plans regarding irrigation and detailed consideration of the effects of particular irrigation projects.

With regard to the community bearing the cost of cleaning up environmental damage, it is apparent that a polluter pays policy would be sufficient. However, while penalties can be imposed on polluters and more effort given to identifying sources, the non-point source nature of pollution from agriculture makes it inevitable that communities bear the weight of the costs of cleanup. Nevertheless, the possibility of addressing this problem in the consideration of particular projects should not be overlooked.

There is support in the community for a hold on considering applications for the use of water until research has been done sufficient to guarantee an acceptable standard. This imperative can be likened to a precautionary approach whereby the nature of an environmental resource is assessed with consideration of its resilience to change. Here the public is not expert in the assessment of environmental effects but indicate that support would be given to conduct research prior to further development. Again there is an opportunity in the assessment of the effects of a development to demonstrate that due consideration has been given to the sufficiency of research to satisfy public concerns. Similarly, due consideration of environmental effects and the consideration of modifying or adding conditions to particular development proposals should be demonstrated as, despite community benefits, there is public concern about effects on drinking water supplies, rivers, streams and lakes.

Many do not know about quality of management and policy making and it is likely that many base their opinion on limited knowledge. Nevertheless, as freshwater management is a growing topic of public interest and there is an increasing perception that agriculture damages freshwater (Hughey, Kerr and Cullen, 2008), it follows that more attention should be given to informing and involving the public in water management. Nevertheless, growing interest and concern justifies more public involvement in regional and national policy development and planning and an increase in the scope and scale of public consultation. In tandem, councillors would better serve the public by giving due attention to freshwater issues and management.

4.5 Conclusion

This research has revealed the opinion of the Canterbury public regarding various important water issues and their management. It is readily apparent that there is a good deal of interest and concern about water issues and management in Canterbury. Given this level of interest and concern it is encouraging that the Proposed National Policy Statement for Freshwater Management is likely to result in greater regional attention to water management together with more local public involvement. In tandem, with ongoing research and contributions to the policy debate it is likely that management will become more effective in the controlling the immediate and downstream effects of water use. Nevertheless, as many of the Canterbury public recognise, there is an immediate need improvement in water management and it is consequently important that consideration be given to remedial actions at the various levels of current management or the sufficient empowerment of authorities to enable effective management.

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Appendix

ENVIRONMENT RESEARCH – SURVEY ON CANTERBURY WATER

Telephone Script and Questions

Hello, my name is _____calling on behalf of Environment Research. We are conducting a survey on Canterbury residents' views regarding water quality in the region and I wondered if you could spare a few minutes to answer some questions.

Yes / No

YES – Proceed to Q1 Respondent Telephone No. _____

NO – reason for refusal if given

1. Too busy
2. Not interested
3. Not interested in subject matter
4. Don't do surveys
5. Other - Please note _____

COMMENCE SURVEY

PLEASE READ: I'm going to read you a series of statements relating to the supply of water in Canterbury. Your answer to each question will be on a rating scale from 1-5, 1 being strongly agree and 5 being strongly disagree. I'll read you the rating scale as we go. If you are unsure of the rating scale at any time, please feel free to ask me to repeat it for you.

TICK ONLY ONE RATING PER QUESTION

Q1. The water in Canterbury rivers, streams and lakes should be suitable for swimming, fishing and other recreational activities.
Do you:

(1) Strongly agree
(2) Agree
(3) Neither agree nor disagree
(4) Disagree
(5) Strongly disagree
(6) Don't know
(7) Pass on question
(8) Refuse

Q2. The priority for water management in Canterbury should be to ensure that every home has a good supply of clean, safe and inexpensive water.
Do you:
Response scale same as question 1

Q3. The quality and quantity of water in Canterbury rivers, streams, lakes and drinking water from underground aquifers should be protected for the benefit of future generations.
Do you:
Response scale same as question 1

Q4. The quality of water in Canterbury should be maintained or improved in order to avoid having to add chlorine to drinking water.
Do you:
Response scale same as question 1

Q5. Home owners should have to pay for each litre of water they use beyond a basic allocation.
Do you:
Response scale same as question 1

Q6. Farmers using water for irrigation and other large commercial users of water should have to pay for each litre of water they use.
Do you:
Response scale same as question 1

Q7. An increase in irrigation for intensive livestock farming will result in the contamination of drinking water supplies and poorer water quality in rivers, streams or lakes.
Do you:
Response scale same as question 1

Q8. The community should not have to pay for the clean up of environmental damage resulting from farming.
Do you:
Response scale same as question 1

Q9. No further water should be allocated for irrigation until research has been done and a guarantee can be given that the quality and quantity of water will not fall below acceptable standards.
Do you:
Response scale same as question 1

Q10. If the Canterbury economy is able to benefit from the use of irrigation water for farming then the community should be willing to accept the effects on drinking water supplies, rivers, streams and lakes.
Do you:
Response scale same as question 1

Q11. Current legislation protects drinking water supplies and rivers, streams and lakes from contamination.
Do you:
Response scale same as question 1

Q12. Environment Canterbury, which is responsible for water management, has done its job of protecting drinking water supplies, rivers, streams and lakes from contamination.
Do you:
Response scale same as question 1

Q13. Local and regional councillors have adequately represented the views and interests of the Canterbury public on management of water.
Do you:
Response scale same as question 1

Q14. Please can you indicate which of the following age groups you belong to?

Are you:
(1) 18-29
(2) 30-39
(3) 40-49
(4) 50-59
(5) 60-69
(6) 70+
(7) refused

Q15. Which of the following income categories do you fit within?

(1) $20,000 or less
(2) $20,001 to $40,000
(3) $40,001 to $70,000
(4) more than $70,001

DO NOT READ:
Q16. Please record gender of respondent
(1) male
(2) female

That concludes our survey. Thank you taking the time to talk to me this evening / morning / afternoon.

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Hunt, Lesley and Fairweather, John 2006

287 New Zealander Reactions to the use of Biotechnology and Nanotechnology in Medicine, Farming and Food
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308 In progress

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146 Papers Presented at the 5th Annual Conference of the NZ Agricultural Economics Society. Blenheim 1998

147 Papers Presented at the 6th Annual Conference of the NZ Agricultural Economics Society. Blenheim 2000

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149 Papers Presented at the 8th Annual Conference of the NZ Agricultural Economics Society. Blenheim 2002

150 Papers Presented at the 9th Annual Conference of the NZ Agricultural Economics Society. Blenheim 2003

151 Papers Presented at the 10th Annual Conference of the NZ Agricultural Economics Society. Blenheim 2004

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